CLAIMS:

What is claimed is:

1. A method for process monitoring, the method comprising the steps of:
receiving a sample made of at least two materials;
scanning multiple targets such as to induce X-ray emission from the multiple targets, whereas the multiple targets positioned within a first region of the sample;
detecting x-ray emitted from said multiple targets; and
creating a map of at least the region of the sample indicating a status of the process in response to the detected X-ray emission from the multiple targets.

2. The method of claim 1 wherein the step of detecting X-ray comprises a wideband detection of emitted X-rays.

3. The method of claim 1 wherein the step of detecting x-ray comprising narrowband detection of x-rays.

4. The method of claim 1 wherein the step of creating a map comprising processing measured x-ray emission in response to characteristics of at least two materials of the target.

5. The method of claim 4 wherein the processing comprises ZAF processing.

6. The method of claim 1 further comprising monitoring the intensity of the beam of charged particles and processing x-ray emission measurements in response to said intensity.

7. The method of claim 1 further comprising a step of locating the multiple targets.

8. The method of claim 7 wherein locating a target comprises acquiring an image of an estimated vicinity of the target and processing the image to locate the target.

9. The method of claim 8 wherein the image is acquired by scanning the sample within an acquisition window.

10. The method of claim 9 wherein a target is scanned within a scanning window that is smaller than the acquisition window.

11. The method of claim 1 wherein a target comprises a first object made of a first material, the first object is partially surrounded by a second object made of a second material.

12. The method of claim 11 wherein the first object is a via or an interconnect.

13. The method of claim 11 wherein the first material is conductor.

14. The method of claim 11 wherein the first object is made of copper and the second object is made of silicone oxide.

15. The method of claim 1 wherein the map reflects the presence of voids within the sample.

16. The method of claim 1 wherein the map reflects deviations in a shape of the target.

17. The method of claim 16 wherein the deviations reflects dishing.

18. The method of claim 1 wherein the map provides an indication about a volume of a void within each target.

19. The method of claim 18 wherein different symbols are allocated to different void volume ranges.

20. The method of claim 18 wherein different colors are allocated to different void volume ranges.

21. The method of claim 1 wherein the map provides an indication about the flatness of each target.

22. The method of claim 21 wherein different symbols are allocated to different flatness value ranges.

23. The method of claim 21 wherein different colors are allocated to different flatness value ranges.

24. The method of claim 1 wherein the map provides an indication about the thickness of each target.

25. The method of claim 24 wherein different symbols are allocated to different thickness ranges.

26. The method of claim 24 wherein different colors are allocated to different thickness ranges.

27. The method of claim 1 wherein the map provides an indication about a depth of a void within each target.

28. The method of claim 27 wherein different symbols are allocated to different void depth ranges.

29. The method of claim 27 wherein different colors are allocated to different void depth ranges.

30. The method of claim 1 further comprising a step of changing a characteristic of a beam of charged particles that scanned the multiple targets to provide a changed beam.

31. The method of claim 30 further comprising scanning the multiple targets with the changed beam of charged, so as to induce additional X-ray emissions from the multiple targets, and detecting the additional x-ray emissions.

32. The method of claim 31 wherein the indication about the process is further responsive to the additional detected x-ray emissions.

33. A system for process monitoring, the system comprising the steps of:

means for scanning multiple targets such as to induce X-ray emission from the multiple targets, whereas the multiple targets positioned within a first region of a sample made of multiple materials;

at least one detector for detecting x-ray emitted from said multiple targets; and

a processor, for creating a map of at least the region of the sample indicating a status of the process in response to the detected X-ray emission from the multiple targets.

34. The system of claim 1 wherein at least one detector is a wideband detector.

35. The system of claim 33 wherein at least one detector is a narrowband detector.

36. The system of claim 33 wherein the processor is adapted to create a map by processing measured x-ray emission in response to characteristics of at least two materials of the target.

37. The system of claim 33 wherein the processing comprises ZAF processing.

38. The system of claim 33 further comprising means for monitoring the intensity of the beam of charged particles and whereas the processor is capable of processing x-ray emission measurements in response to said intensity.

39. The system of claim 1 further adapted to locate the multiple targets.

40. The system of claim 39 wherein locating a target comprises acquiring an image of an estimated vicinity of the target and processing the image to locate the target.

41. The system of claim 39 wherein the system is adapted to acquire the image by scanning the sample within an acquisition window.

42. The system of claim 41 wherein the system is adapted to scan a target within a scanning window that is smaller than the acquisition window.

43. The system of claim 33 wherein the map reflects the presence of voids within the sample.

44. The system of claim 33 wherein the map reflects deviations in a shape of the target.

45. The system of claim 33 wherein the deviations reflects dishing.

46. The system of claim 33 wherein the map provides an indication about a volume of a void within each target.

47. The system of claim 46 wherein the processor allocates different symbols to different void volume ranges.

48. The system of claim 18 wherein the processor allocates different colors to different void volume ranges.

49. The system of claim 1 wherein the map provides an indication about the flatness of each target.

50. The system of claim 49 wherein the processor allocates different symbols to different flatness value ranges.

51. The system of claim 50 wherein different colors are allocated to different flatness value ranges.

52. The system of claim 1 wherein the map provides an indication about the thickness of each target.

53. The system of claim 52 wherein the processor allocates different symbols to different thickness ranges.

54. The system of claim 52 wherein the processor allocates different colors to different thickness ranges.

55. The system of claim 1 wherein the map provides an indication about a depth of a void within each target.

56. The system of claim 55 wherein the processor allocates different symbols to different void depth ranges.

57. The system of claim 5 wherein the processor allocates different colors to different void depth ranges.

58. The system of claim 1 further adapted to change a characteristic of a beam of charged particles that scanned the multiple targets to provide a changed beam.

59. The system of claim 58 further adapted to scan the multiple targets with the changed beam, so as to induce additional X-ray emissions from the multiple targets, and to detect the additional x-ray emissions.

60. The system of claim 59 wherein the indication about the process is further responsive to the additional detected x-ray emissions.